CLAIMS

1. An anode for electrowinning aluminium from alumina dissolved in a molten electrolyte, said anode comprising a cobalt-containing metallic outer part that is covered with an integral oxide layer containing predominantly cobalt oxide CoO.

2. The anode of claim 1, wherein the integral oxide layer has an open porosity of up to 12%, in particular up to 7%.

3. The anode of claim 1 or 2, wherein the integral oxide layer has an average pore size below 7 micron, in particular below 4 micron.

4. The anode of any preceding claim, wherein the metallic outer part contains:

- at least one of nickel, tungsten, molybdenum, tantalum and niobium in a total amount of 5 to 30 wt%, in particular 10 to 20 wt%, said nickel, when present, being contained in the metallic outer part in an amount of up to 20 weight% of the metallic outer part, in particular 5 to 15 weight%; and
- one or more further elements and compounds in a total amount of up to 5 wt%,

the balance being cobalt.

5. The anode of any preceding claim, wherein the metallic outer part contains cobalt in an amount of at least 95 wt%, in particular more than 97 wt% or 99 wt%.

6. The anode of any preceding claim, wherein the metallic outer part contains a total amount of 0.1 to 2 wt% of at least one additive selected from silicon, manganese, tantalum and aluminium, in particular 0.1 to 1 wt%.

7. The anode of any preceding claim, wherein the integral oxide layer contains cobalt oxide CoO in an amount of at least 80 wt%, in particular more than 90 wt% or 95 wt%.

8. The anode of any preceding claim, wherein the integral oxide layer is substantially free of Co_2O_3 and substantially free of Co_3O_4.

9. The anode of any preceding claim, wherein the integral oxide layer is electrochemically active for the oxidation of oxygen ions and is uncovered or is covered with an electrolyte-pervious layer.

10. The anode of any one of claims 1 to 8, wherein the integral oxide layer is covered with an applied protective layer, in particular an applied oxide layer.

11. The anode of claim 10, wherein the applied protective layer contains cobalt oxide.

12. The anode of claim 10 or 11, wherein the applied protective layer contains iron oxide.

13. The anode of claim 12, wherein the applied protective layer contains oxides of cobalt and of iron, in particular cobalt ferrite.

14. The anode of any one of claims 10 to 13, wherein the protective layer contains a cerium compound, in particular cerium oxyfluoride.

15. The anode of any one of claims 10 to 14, wherein the applied protective layer is electrochemically active for the oxidation of oxygen ions and is uncovered or is covered with an electrolyte pervious-layer.

16. The anode of any preceding claim, which has an electrochemically active surface that contains at least one dopant, in particular at least one dopant selected from iridium, palladium, platinum, rhodium, ruthenium, silicon, tantalum, tin or zinc metals, Mischmetal and their oxides and metals of the Lanthanide series as well as mixtures and compounds thereof, in particular oxides.

17. The anode of claim 16, wherein the electrochemically active surface contains a total amount of 0.1 to 5 wt% of the dopant(s), in particular 1 to 4 wt%.

18. A method of manufacturing an anode as defined in any preceding claim, comprising:

- providing an anode body having a cobalt-containing metallic outer part; and
- subjecting the outer part to an oxidation treatment under conditions for forming an integral oxide layer containing predominantly CoO on the outer part.

19. The method of claim 18, wherein the oxidation treatment is carried out in an oxygen containing atmosphere, such as air.

20. The method of claim 18 or 19, wherein the oxidation treatment is carried out at an oxidation temperature above 895°C or 920°C, preferably above 940°C, in particular within the range of 950 to 1050°C.

21. The method of claim 20, wherein the metallic outer part is heated from room temperature to said oxidation temperature at a rate of at least 300°C/hour, in particular at least 450°C/hour, for example by being placed in an environment, in particular in an oven, that is preheated at said oxidation temperature.

22. The method of claim 20 or 21, wherein the oxidation treatment at said oxidation temperature is carried out for more than 8 or 12 hours, in particular from 16 to 48 hours.

23. The method of any one of claims 18 to 22, wherein the outer part is further oxidised during use.

24. A cell for the electrowinning of aluminium from alumina dissolved in a molten electrolyte, in particular a fluoride-containing electrolyte, which cell comprises an anode as defined in any claims 1 to 17.

25. The cell of claim 24, wherein said anode is in contact with a molten electrolyte of the cell, the electrolyte being at a temperature below 960°C, in particular in the range from 910° to 940°C.

26. A method of electrowinning aluminium in a cell as defined in claim 24 or 25, said method comprising passing an electrolysis current via the anode through the electrolyte to produce oxygen on the anode and aluminium cathodically by electrolysing the dissolved alumina contained in the electrolyte.

27. The method of claim 26, wherein oxygen ions are oxidised on the anode's integral oxide layer that contains predominantly cobalt oxide CoO.

28. The method of claim 26 or 27, wherein oxygen ions are oxidised on an active layer applied to the anode's integral oxide layer that contains predominantly cobalt oxide CoO, said integral oxide layer inhibiting oxidation and/or corrosion of the anode's metallic outer part.

29. A component of a cell for the electrowinning of aluminium, in particular an anode stem, a sidewall or a cell cover, said component comprising a cobalt-containing metallic outer part that is covered with an integral oxide layer containing predominantly cobalt oxide CoO.